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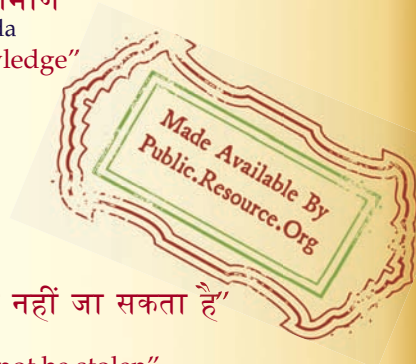
IS 9147 (1979): Cable sealing boxes for oil immersed transformers suitable for paper insulated lead sheathed cables for highest system voltages from 12 kV upto and including 36 kV [ETD 16: Transformers]



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**IS : 9147 - 1979**

**( Reaffirmed 1996 )**

## ***Indian Standard***

# **SPECIFICATION FOR CABLE SEALING BOXES FOR OIL-IMMERSED TRANSFORMERS SUITABLE FOR PAPER-INSULATED LEAD- SHEATHED CABLES FOR HIGHEST SYSTEM VOLTAGES FROM 12 kV UP TO AND INCLUDING 36 kV**

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**BUREAU OF INDIAN STANDARDS  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002**

**Gr 8**

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# *Indian Standard*

## SPECIFICATION FOR CABLE SEALING BOXES FOR OIL-IMMERSED TRANSFORMERS SUITABLE FOR PAPER-INSULATED LEAD- SHEATHED CABLES FOR HIGHEST SYSTEM VOLTAGES FROM 12 kV UP TO AND INCLUDING 36 kV

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# *Indian Standard*

## **SPECIFICATION FOR CABLE SEALING BOXES FOR OIL-IMMERSED TRANSFORMERS SUITABLE FOR PAPER-INSULATED LEAD SHEATHED CABLES FOR HIGHEST SYSTEM VOLTAGES FROM 12 kV UP TO AND INCLUDING 36 kV**

### **0. FOREWORD**

**0.1** This Indian Standard was adopted by the Indian Standards Institution on 26 February 1979, after the draft finalized by the Transformers Sectional Committee had been approved by the Electrotechnical Division Council.

**0.2** This standard specifies the requirements for cable sealing boxes with the intention that the cable sealing boxes produced by different manufacturers complying with this standard shall be interchangeable. It gives the details of cable sealing boxes corresponding to both the types of construction, namely, the one in which the transformer bushings are brought out on the top of the tank cover and the one in which the bushings are brought out through the sides of the tank. The cable sealing boxes for 12 kV rating would be suitable for bottom as well as top cable entry. In the preparation of this standard, the current practices being followed in the country have been kept in view.

**0.3** The cable sealing boxes covered by this standard are suitable for paper insulated lead-sheathed cables conforming to IS : 692-1973\*.

**0.4** The preparation of an Indian Standard specification for cable sealing boxes with reduced dimensions suitable for currents up to 100 A and for instrument transformers is under consideration.

**0.5** In the preparation of this standard considerable assistance has been derived from the following:

BS : 2562 (Part I)-1955 'Cable sealing boxes for oil-immersed transformers : Part I Boxes for voltages up to and including 11 kV', issued by the British Standards Institution.

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\*Specification for paper insulated lead-sheathed cables for electricity supply (second revision).

BS : 2562 ( Part II )-1959 'Cable sealing boxes for oil-immersed transformers : Part II Boxes for 22 kV and 33 kV solid type cables', issued by the British Standards Institution.

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## 1. SCOPE

**1.1** This standard covers the dimensions, requirements and methods of tests for three-pole cable sealing boxes filled completely with insulating compound, for transformers having highest system voltages from 12 kV up to and including 36 kV for use with paper insulated lead-sheathed cables conforming to IS : 692-1973\*. These boxes are suitable for operating indoors and outdoors.

## 2. TERMINOLOGY

**2.0** For the purpose of this standard, the following definitions in addition to those given in IS : 1885 ( Part XXXVIII )-1977†, shall apply.

**2.1 Cable Sealing Box** — A metallic box designed for the purpose of receiving and protecting the end of a metal-sheathed cable or cables and containing a suitable insulating compound so that the cable is effectively sealed against the ingress of moisture.

**2.2 Bushing Mounting Plate** — The metal plate on which the bushing between the cable sealing box and the transformer are mounted.

**2.3 Shell** — The casing of a cable sealing box including the bushing mounting plate and the gland plate, but excluding the bushings, cable glands, armour clamps and stress cones.

**2.4 Pole** — An insulated conducting path between the interior of the cable sealing box and the transformer.

**2.5 Winding Gland** — A non-ferrous metal bushing to which the metal sheathing of a cable is plumbed and which secures the cable to the cable sealing box.

**2.6 Insulated Wiping Gland** — A wiping gland insulated from the cable sealing box.

**2.7 Armour Clamp** — A fitting for gripping and terminating the armour of a cable.

**2.8 Terminal** — That metal part intended to receive the external connections.

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\*Specification for paper insulated lead-sheathed cables for electricity supply ( *second revision* ).

†Specification for electrotechnical vocabulary : Part XXXVIII Transformers ( *first revision* ).



**2.9 Bushing** — A porcelain part carrying a conductor and intended to support and insulate it, the term includes the means of attachment.

### 3. RATING

**3.1** The preferred kV/A rating of cable sealing box shall be chosen from the following:

12/250, 12/630, 12/1 000, 24/630 and 36/630

NOTE — Cable sealing boxes of other ratings and their dimensions shall be subject to agreement between the manufacturer and the purchaser.

**3.2** The number and size of glands for various ratings shall be chosen from those shown in Fig. 6, 7 and 8 ( see pages 13 to 15 ).

### 4. DESIGN AND CONSTRUCTION

#### 4.1 Electrical Requirements

**4.1.1** The cable sealing box when in position on the transformer with which it is to be used, shall be capable of withstanding the separate source voltage withstand test specified in IS : 2026 ( Part III )-1977\*.

NOTE — For the purpose of testing at the manufacturer's works, it is permissible to insert temporary barriers in the box where necessary, instead of the filling medium.

**4.1.2** The cable sealing box shall also be capable of withstanding the high voltage tests that may be carried out on the cables according to IS : 692-1973† at the time of installation and subsequently when in operation.

**4.1.3 Clearances** — The minimum clearance between phases ( terminals ), and phases and earth shall be as specified in Table 1.

#### 4.2 Magnetic Requirement

**4.2.1 Eddy Current** — For currents in excess of 500A, non-magnetic inserts shall be provided in bushing mounting plate. In case of single-core and multi-core individual-sheathed cables, the non-magnetic inserts shall be provided in the gland mounting plate.

#### 4.3 Mechanical Requirements

**4.3.1** The design of the cable sealing box shall be such that no rain water shall enter into it and that no moisture shall have an access into the box due to changes in temperature.

\*Specification for power transformers: Part III Insulation levels and dielectric tests (first revision).

†Specification for paper insulated lead-sheathed cables for electricity supply (revised).

**TABLE 1 MINIMUM ELECTRICAL CLEARANCES***( Clauses 4.1.3 and 4.3.11 )*

HIGHEST SYSTEM VOLTAGE	INSULATING MEDIUM	CLEARANCE BETWEEN PHASES	DIRECT CLEARANCE TO EARTH	CLEARANCE TO EARTH OVER PORCE- LAIN OR SIMILAR MATERIAL	CLEARANCE TO EARTH OVER CABLE SURFACE
(1)	(2)	(3)	(4)	(5)	(6)
kV		mm	mm	mm	mm
12	Bituminous compound*	50	50	75	125
24	Bituminous compound* or semi- fluid com- pound	100	75	125	190
36	Semi-fluid compound	125	100	150	250

\*The bituminous compound shall conform to IS:7084-1973 'Specification for bituminous based filling compounds for electrical purposes'.

#### **4.3.2 Threads of bolts or studs shall not penetrate the shell.**

**4.3.3** The cable sealing box shall be so designed that the overall width does not exceed the width of the corresponding flange.

**4.3.4** The compound filling hole shall be so situated and shall be of such a size as to enable the box to be readily filled in one continuous operation.

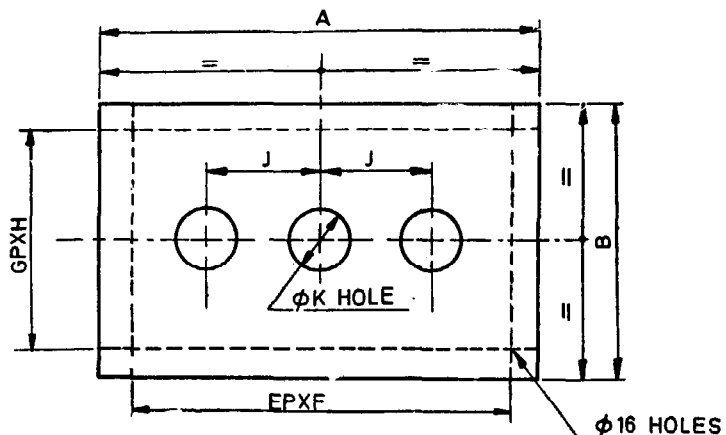
**4.3.5** Each cable sealing box shall be provided with suitable draining hole ( plug ) for the filling medium and venting hole, if necessary.

**4.3.6** The contour and the expansion space shall be so designed that voids are not formed either during the filling operation or due to changes in the level of the insulating medium caused by the temperature variations.

**4.3.7** The cable sealing box shall be so constructed that it is suitable for use with the insulating compound given under col (2) of Table 1.

**4.3.8** The cable sealing box shall be so designed that the jointing and connecting up of cables is facilitated.

**4.3.9** The cable sealing box shall have the flange dimensions as shown in Fig. 1.



RATING kV/A	A	B	EP × F	GP × H	J	K
12/250	470	215	105 × 4	85 × 2	105	60
12/630	570	215	105 × 5	85 × 2	135	60
12/1 000	610	215	95 × 6	85 × 2	135	85
24/630	680	340	90 × 7	100 × 3	170	85
36/630	780	380	92 × 8	85 × 4	200	120

Tolerances on dimensions : ' Extra Coarse ' according to IS : 2102-1969\*

Number of poles 3

Material Mild steel conforming to IS : 5986-1970†

All dimensions in millimetres.

FIG. 1 BUSHING MOUNTING PLATE

**4.3.10** A minimum expansion space of 8 percent, above the level of the filling medium at 40°C, shall be provided.

**4.3.11** At a temperature of -5°C the level of the filling medium shall be such as to maintain the minimum clearances specified in Table 1.

**NOTE** — It is recommended that all gaskets and packings should be of synthetic rubber bonded cork sheets.

\*Allowable deviations for dimensions without specified tolerances (*first revision*).

†Specification for hot-rolled steel plates and flats for cold-forming and flanging operations.

## 5. FITTINGS AND ACCESSORIES

**5.1 Bushings** — The bushings shall comply with IS : 2099-1973\* wherever applicable.

**5.1.1 Terminal Stems** — The dimensions of terminal stems shall be as shown in Fig. 2.

**5.1.2** Standard metric threads conforming to IS : 4218 ( Part I )-1976† to IS : 4218 ( Part VI )-1978† shall be used.

## 5.2 Wiping Glands

**5.2.1** The wiping glands shall conform to the dimensions shown in Fig. 3.

NOTE — The small gland can be used with cables from 12 mm to 55 mm diameter over lead and the large gland may be used for cables from 25 mm to 85 mm diameter over lead.

**5.2.2** The studs for fixing the glands to the cable sealing box shall be made from mild steel bar and the diameter of the studs used for fixing the cable glands to the cable sealing box shall be 10 mm for the small gland and 12 mm for the large gland and the threading used shall be M10 and M12 respectively.

**5.2.3** Whenever single-core cables or multicore individual-sheathed cables are terminated in the gland, the gland shall be insulated. The glands for all sizes of multicore cables of common-sheathed type shall be as given in Fig. 4A. The gland assembly for single-core and multicore individual sheathed cable terminations shall be as given in Fig. 4B.

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\*Specification for bushing for alternating voltages above 1 000 volts (*first revision*).

†Specification for ISO metric screw threads:

Part I Basic and design profile (*first revision*).

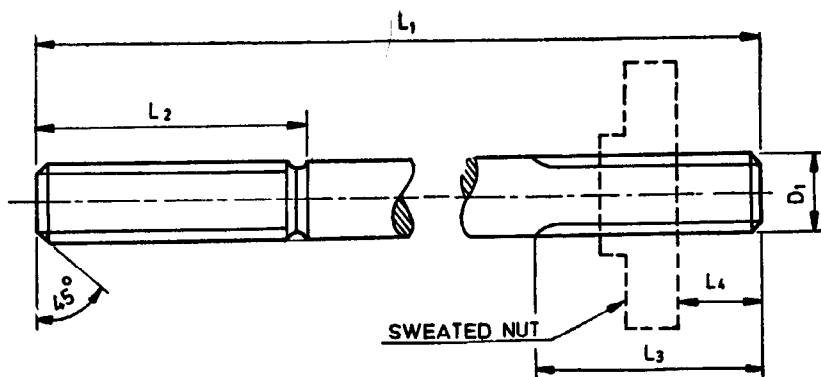
Part II Diameter pitch combination (*first revision*).

Part III Basic dimensions for design profile (*first revision*).

Part IV Tolerancing system (*first revision*).

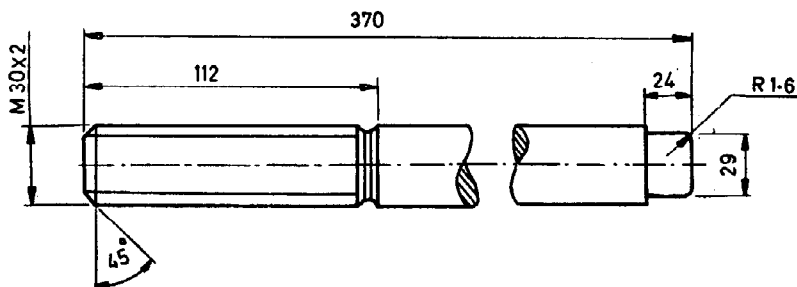
Part V Tolerances (*first revision*).

Part VI Limits of sizes for commercial bolts and nuts diameter range 1 to 52 mm (*first revision*).



2A For cable sealing box bushing 12/250, 12/630, 24/630 and 36/630 kV/A

RATING kV/A	$D_1$	$L_1$	$L_2$	$L_3$	$L_4$
12/250	M12	355	72	60	36
12/630	M20	400	97	75	52
24/630	M20	470	97	75	52
36/630	M20	560	97	75	52



2B For cable sealing box bushing 12/1 000 kV/A

Tolerances on dimensions : 'Coarse' according to IS: 2102-1969\*

Material : EHC grade of IS : 191-1967†

Thread run-out and undercut shall be according to IS : 1369-1975‡

Chamfered ends shall be according to IS : 1368-1967§

All dimensions in millimetres.

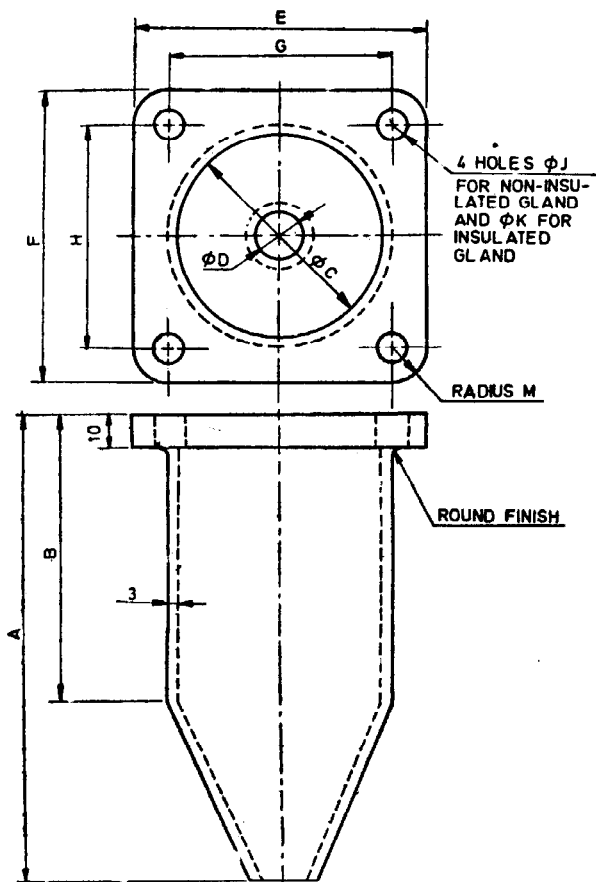
FIG. 2 TERMINAL STEM FOR CABLE SEALING BOX BUSHING

\*Allowable deviations for dimensions without specified tolerances (first revision).

†Specification for copper (second revision).

‡Dimensions of screw thread run-outs and undercuts (first revision).

§Dimensions of ends of bolts and screws (first revision).



GLAND SIZE	A	B	C	D	E	F	G	H	J	K	M
Small	140	90	60	12	90	90	67	67	11	15	10
Large	155	95	90	25	125	115	95	85	15	17.5	15

Tolerances on dimensions : Coarse according to IS : 2102-1969\*

Material : Grade 3 according to IS : 292-1961†

NOTE 1 — Casting shall be clean and free from blow holes.

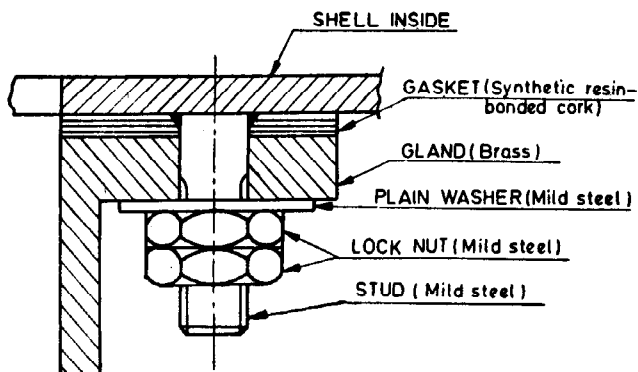
NOTE 2 — Flange shall be square to gland bore.

All dimensions in millimetres.

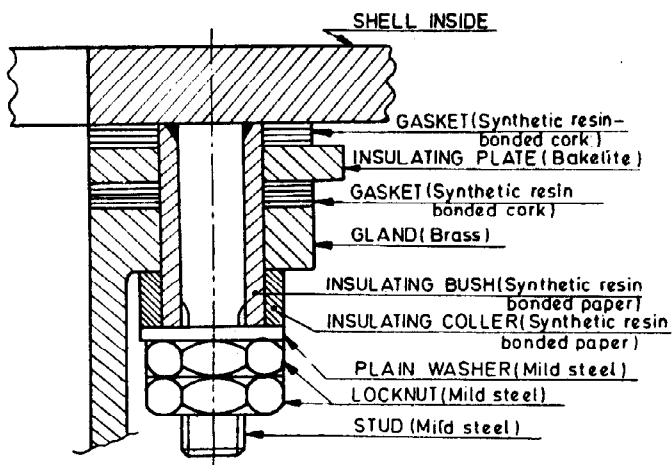
FIG. 3 WIPING GLAND

\*Allowable deviations for dimensions without specified tolerances (*first revision*).

†Specification for brass ingots and castings (*revised*).



4A ( Non-insulated ) for multicore common-sheathed cable



4B ( Insulated ) for multicore cable of individual sheath type or single-core sheathed cables

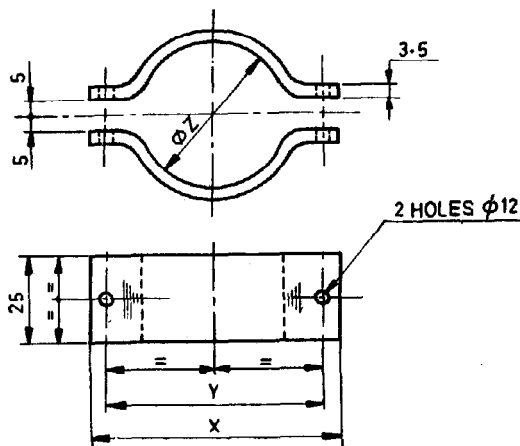
FIG. 4 WIPING GLAND ASSEMBLY

**5.2.4** The material used for insulation shall be synthetic resin-bonded paper tube/board not less than 5 mm in thickness.

**5.2.5** The glands shall normally be used for lead-sheathed cables.

**NOTE** — These glands shall be suitable for use with aluminium-sheathed cables when the cable sealing boxes suitable for such cables are included in the specification.

**5.3 Armour Clamp** — The dimensions of armour clamp shall be as shown in Fig. 5.



GLAND	X	Y	Z
Small	140	115	75
Large	170	145	105

Tolerances on dimensions : 'Extra Coarse' according to IS : 2102-1969\*

Material : Mild steel 25 × 5 according to IS : 1731-1971†

All dimensions in millimetres.

FIG. 5 ARMOUR CLAMP

**5.4 Flange Facings** — The flange facings and the dimensional details shall be as shown in Fig. 1.

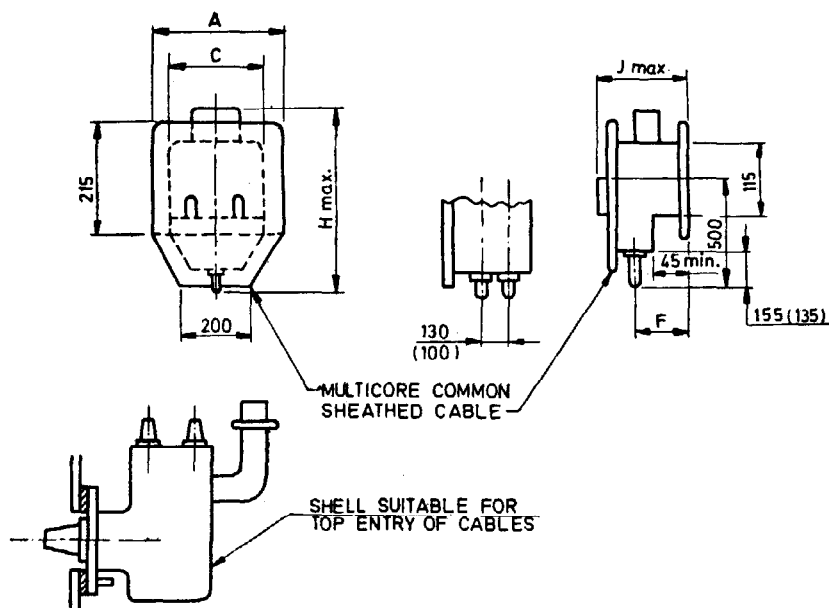
### 5.5 Shell

**5.5.1** The dimensions of shell for 12 kV cable sealing box shall be as shown in Fig. 6.

\*Allowable deviations for dimensions without specified tolerances (*first revision*).

†Dimensions of steel flats for structural and general engineering purposes (*first revision*).





RATING kV/A	No. OF GLANDS	A	C	F	H Max	J Max	EXPANSION CHAMBER SIZE (see FIG. 15)
12/250	{ 1	470	370	155	875	365	1
	{ 2	470	370	155	875	495	1
	{ 3	470	370	155	875	625	1
12/630	{ 1	570	470	155	875	365	3
	{ 2	570	470	155	875	495	3
	{ 3	570	470	155	875	625	3
	{ 4	570	470	155	875	755	3
	{ 6	570	470	155	875	1 015	4
12/1 000	{ 4	610	510	250	875	865	4
	{ 6	610	510	250	875	1 125	4

Tolerances on dimensions : 'Coarse' according to IS : 2102-1969\*

Type of cable : Multicore common-sheathed cable

Number of poles : 3

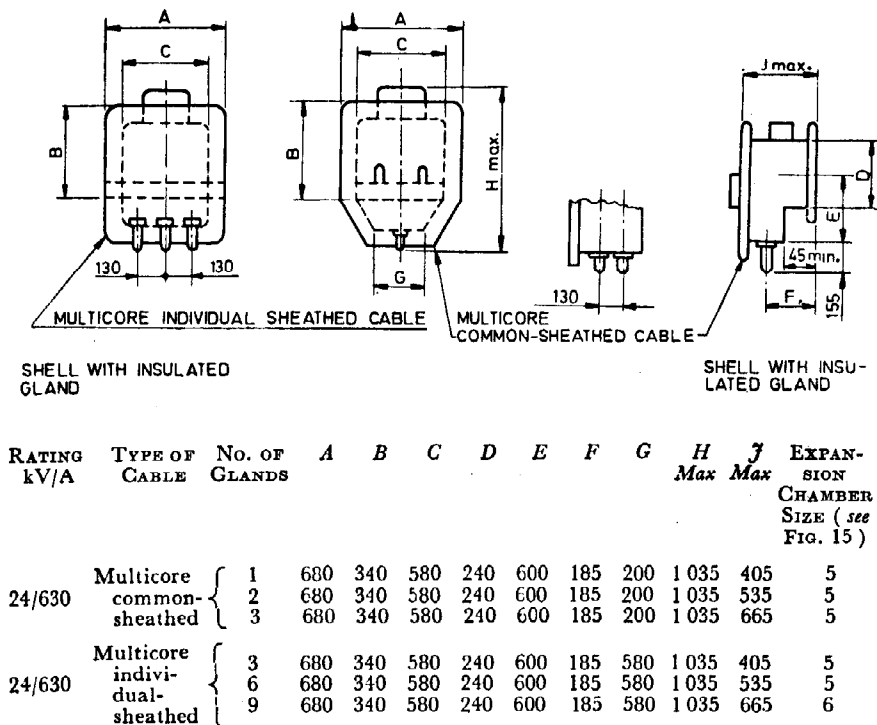
NOTE — Dimensions in bracket are for small gland.

All dimensions in millimetres.

FIG. 6 SHELL FOR 12 kV CABLE SEALING BOX

\*Allowable deviations for dimensions without specified tolerances (*first revision*).

5.5.2 The dimensions of shell for 24 kV cable sealing box shall be as shown in Fig. 7.



Tolerances on dimensions : 'Coarse' according to IS : 2102-1969\*

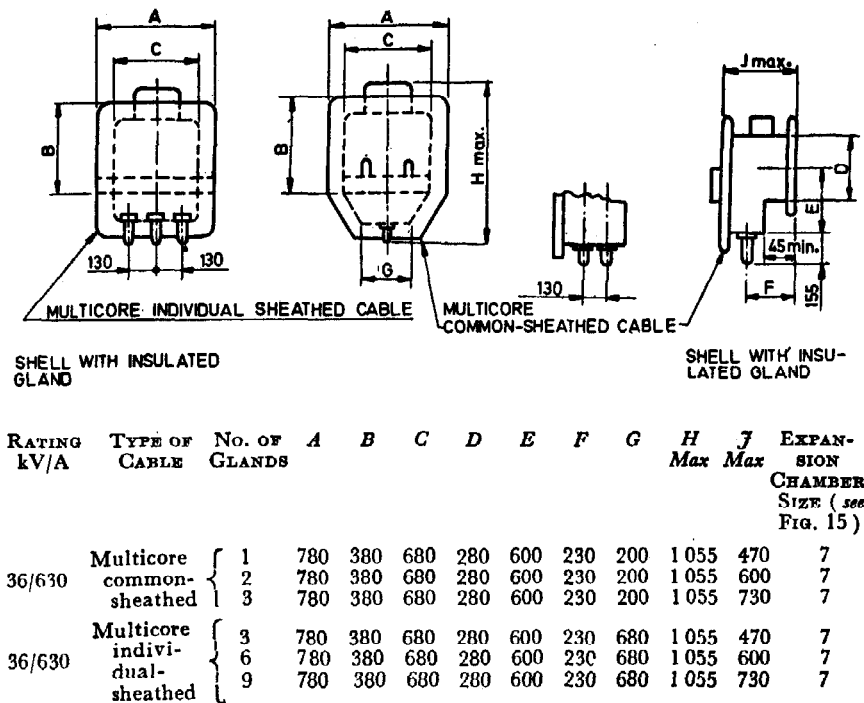
Number of poles : 3

All dimensions in millimetres.

FIG. 7 SHELL FOR 24 kV CABLE SEALING BOX

\*Allowable deviations for dimensions without specified tolerances (first revision).

5.5.3 The dimensions of shell for 36 kV cable sealing box shall be as shown in Fig. 8.



Tolerances on dimensions : ' Coarse ' according to IS : 2102-1969\*

Number of poles : 3

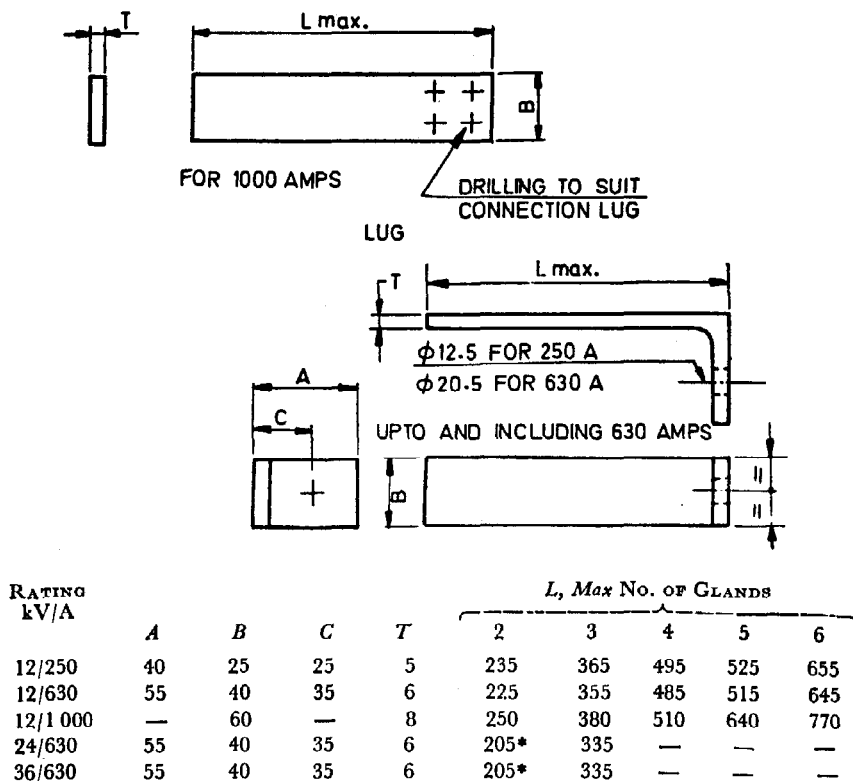
All dimensions in millimetres.

FIG. 8 SHELL FOR 36 kV CABLE SEALING BOX

\*Allowable deviations for dimensions without specified tolerances (first revision)

## 5.6 Bushing Connecting Lug

**5.6.1** The dimensions of connector for multicore individual-sheathed and common-sheathed cables shall be as shown in Fig. 9.



Tolerances on dimensions : 'Coarse' according to IS : 2102-1969†

Material : Copper bar tinned according to IS : 613-1964‡

All dimensions in millimetres.

**FIG. 9 CONNECTOR FOR MULTICORE COMMON-SHEATHED CABLES**

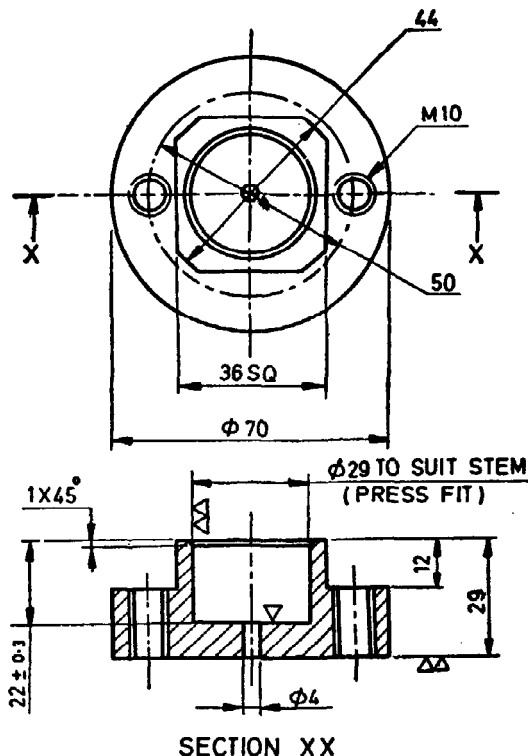
\*These dimensions are also suitable for multicore individual-sheathed cables.

†Allowable deviations for dimensions without specified tolerances (*first revision*).

‡Specification for copper rods for electrical purposes (*revised*).

5.6.2 The dimensions of connector ( oil end ) for 12/1 000 kV/A cable sealing box bushing shall be as shown in Fig. 10.

5.6.3 The dimensions of the connecting lug for 12/1 000 kV/A shall be as shown in Fig. 11.



Tolerances on dimensions : ' Coarse ' according to IS : 2102-1969\*

Material : Brass according to IS : 292-1961†

NOTE 1 — Casting should be clean and free of blow holes.

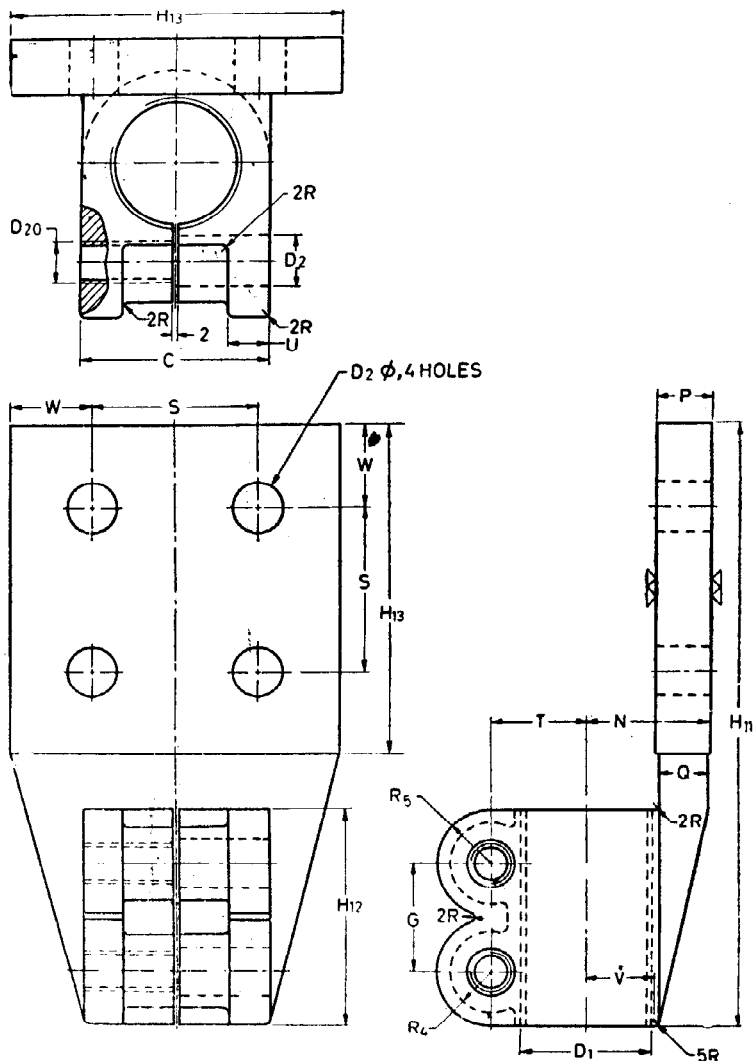
NOTE 2 — ▽ rough machining, ▽▽ medium machining.

All dimensions in millimetres.

FIG. 10 CONNECTOR ( OIL END ) FOR 12/1 000 kV/A

\*Allowable deviations for dimensions without specified tolerances (*first revision*).

†Specification for brass ingots and castings (*revised*).



C	D <sub>1</sub>	D <sub>2</sub>	D <sub>20</sub>	G	H <sub>11</sub>	H <sub>12</sub>	H <sub>13</sub>	S	W	N	T	P	Q	R <sub>4</sub>	R <sub>5</sub>	U	V
45	M30×2	14	M12	30	130	60	60	32	14	30	25	12	10	10	15	10	16

Tolerances on dimensions : 'Extra coarse' according to IS : 2102-1969\*

Material : Grade 3 Brass according to IS : 292-1961†

NOTE 1 — Casting should be sound and free of blow holes.

NOTE 2 — ▽▽ medium machining.

NOTE 3 — This part is identical to that shown in Fig. 23 of IS : 3347 (Part III/ Sec 2)-1967‡ for copper stem 12, 17.5/1000.

All dimensions in millimetres.

FIG. 11 CONNECTING LUG FOR 12 kV/1000 A

\*Allowable deviations for dimensions without specified tolerances (*first revision*).

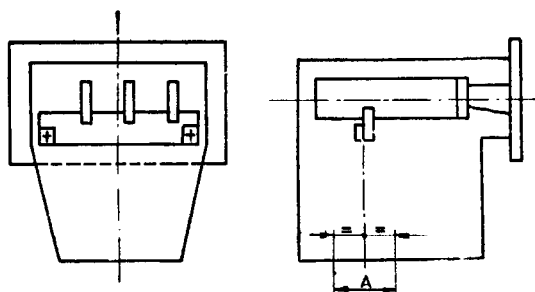
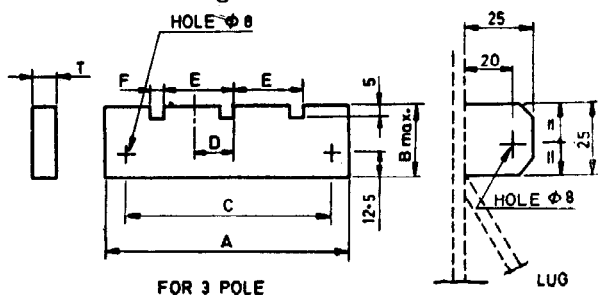
†Specification for brass ingots and castings (*revised*).

‡Dimensions for porcelain transformer bushings: Part III 12 and 17.5 kV bushings. Section 2 Metal parts.

5.6.4 The dimensions of connector support shall be as shown in Fig. 12.

### 5.7 Bushing Clamps

5.7.1 The dimensions of clamp for cable sealing box bushing for 12 and 24 kV shall be as shown in Fig. 13.



RATING kV/A	A	B +0 -3	C	D	E	F	T
12/250	360	50	330	25.5	105	6	10
12/630	460	45	430	35.5	135	7	10
12/1 000	500	35	470	19	135	10	15
24/630	570	105	540	35.5	170	7	15
36/630	670	125	640	35.5	200	7	15

Tolerances on dimensions : 'Extra coarse' according to IS : 2102-1969\*

Material : Synthetic resin bonded paper

Material : Mild steel 6 mm thick according to IS : 5986-1970†

NOTE 1 — No support is required up to 2 rows of glands.

NOTE 2 — One support is required for 3 and 4 rows of glands.

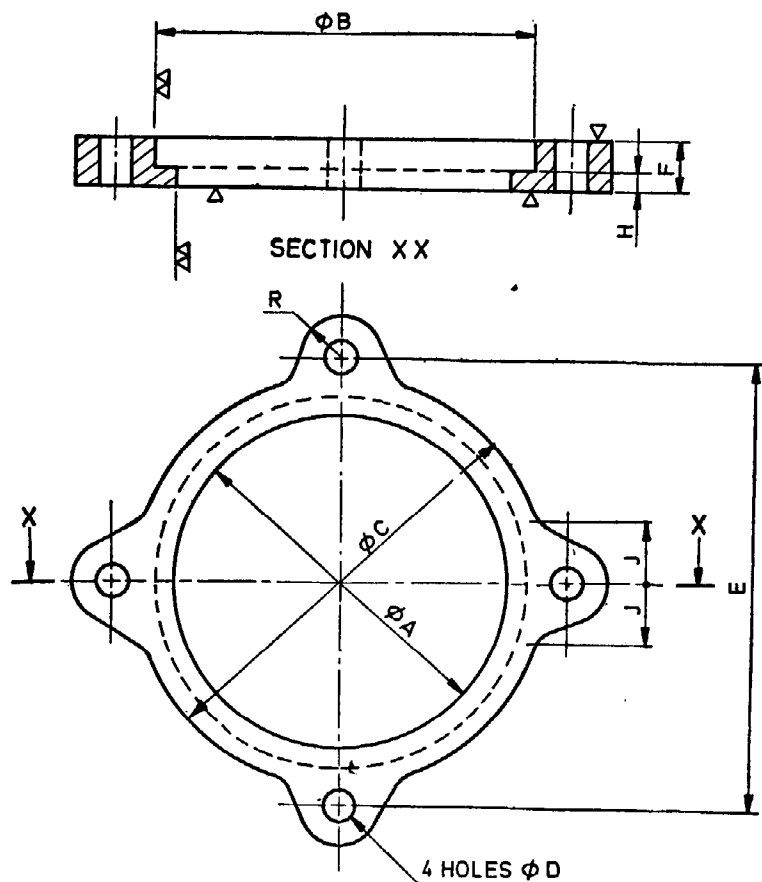
NOTE 3 — Two supports are required for rows of glands 5 and above.

All dimensions in millimetres.

FIG. 12 CONNECTOR SUPPORT

\*Allowable deviations for dimensions without specified tolerances (*first revision*).

†Specification for hot-rolled steel plates and flats for cold-forming and flanging operations.



RATING kV/A	A	B	C	D	E	F	H	J	R
12/250	62	73	83	12	95	12	5	16	10
12/630									
24/630	83	98	108	12	120	12	5	19	10
12/1 000									

Tolerances on dimensions : ' Coarse ' according to IS : 2102-1969\*

Material : Cast brass according to IS : 292-1961†

NOTE 1 — Alternative material and construction may be used provided mechanical interchangeability is achieved.

NOTE 2 — Casting should be sound and free of blow holes.

NOTE 3 — ▽ indicates rough machining.

NOTE 4 — ▽▽ indicates medium machining.

All dimensions in millimetres.

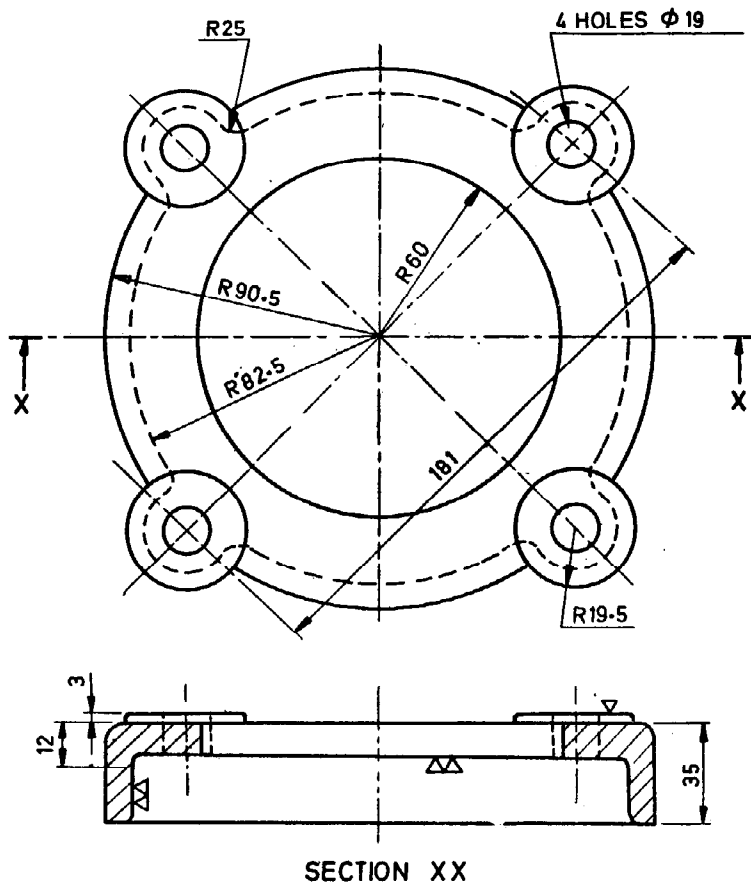
FIG. 13 CLAMP FOR 12 AND 24 kV CABLE SEALING BOX BUSHING

\*Allowable deviations for dimensions without specified tolerances (first revision).

†Specification for brass ingots and castings (revised).



**5.7.2** The dimensions of clamp for 36/630 kV/A cable sealing box bushing shall be as shown in Fig. 14.



**SECTION XX**

Tolerances on dimensions : ' Coarse ' according to IS : 2102-1969\*

Material : Cast brass according to IS : 292-1961†

**NOTE 1** — Alternative material and construction may be used provided mechanical interchangeability is achieved.

**NOTE 2** — Casting should be sound and free of blow holes.

**NOTE 3** — ▽ indicates medium machining.

**NOTE 4** — ▽ indicates rough machining.

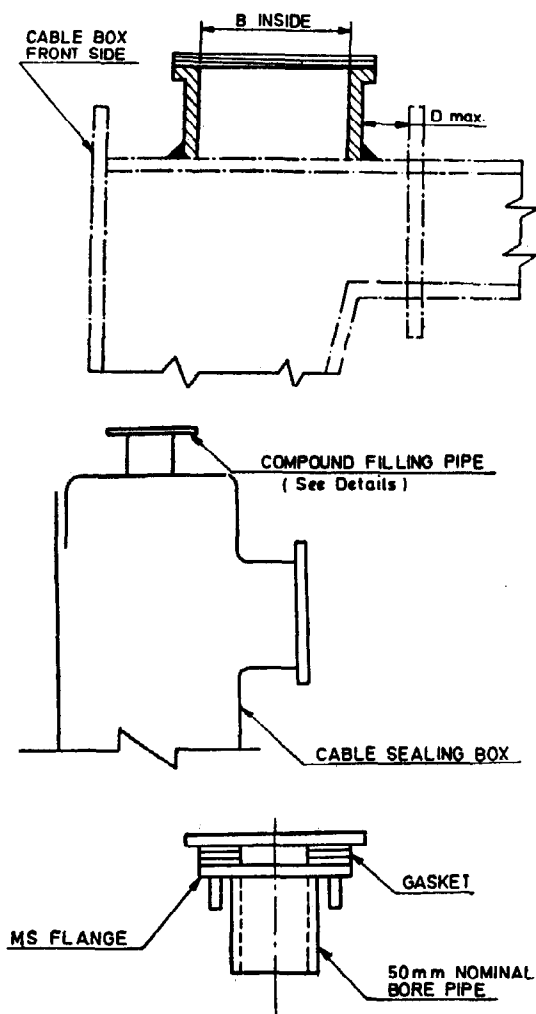
All dimensions in millimetres.

**FIG. 14 CLAMP FOR 36/630 kV/A CABLE SEALING BOX BUSHING**

\*Allowable deviations for dimensions without specified tolerances (*first revision*).

†Specification for brass ingots and castings (*revised*).

**5.8 Expansion Chamber** — The expansion chamber may be in accordance with Fig. 15. The figure is however illustrative and is given for guidance.



SIZE	A	B	C	$D \begin{smallmatrix} +0 \\ -2 \end{smallmatrix}$
1	300	190	140	50
2	300	300	140	50
3	420	190	140	50
4	420	300	140	50
5	580	190	140	70
6	580	300	140	70

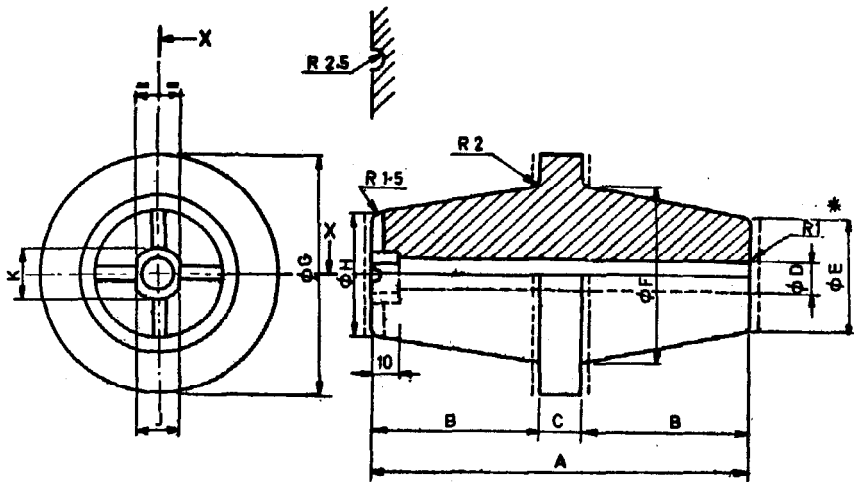
SIZE	A	B	C	$D^{+0}_{-2}$
7	650	250	140	100
8	100	150	100	50
9	150	190	100	50
10	150	280	100	50
11	190	190	140	70
12	240	240	140	100

Tolerances on dimensions : ' Extra Coarse ' according to IS : 2102-1969\*  
All dimensions in millimetres.

FIG. 15 EXPANSION CHAMBER ( TYPICAL )

**5.9 Bushing Assembly** — Typical bushing assemblies are given in Appendix A.

**5.10 Insulators** — The dimensions for insulator for 12 kV cable sealing box bushing shall be as shown in Fig. 16. The dimensions for 24 and 36 kV cable sealing box bushing shall be as shown in Fig. 17.



SECTION XX

RATING kV/A	A	B	C	D	E	$F^{+0}_{-2}$	$G^{+0}_{-2}$	H	J	K
12/250	220	100	20	14	35	56	80	45	20	26
12/630	220	100	20	22	50	56	80	56	28	41
12/1 000	220	100	20	38	70	80	108	70	37	46

Tolerances on dimensions :  $\pm 2$  percent.

Material : Brown glazed porcelain.

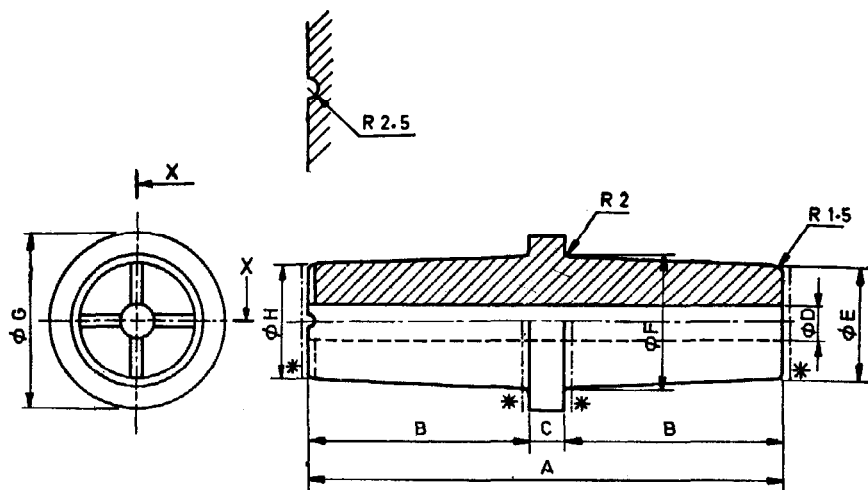
NOTE 1 — '-----' indicates ground surface.

NOTE 2 — '\*' indicates surfaces perpendicular to the axis.

All dimensions in millimetres.

FIG. 16 INSULATOR FOR 12 kV CABLE SEALING BOX BUSHING

\* Allowable deviations for dimensions without specified tolerances (first revision).



SECTION XX

RATING kV/A	A	B	C	D	E	$F +0$ $-2$	$G +0$ $-2$	H
24/630	290	135	20	41	70	80	108	70
36/630	380	177.5	25	41	70	115	160	70

Tolerances on dimensions :  $\pm 2$  percent

Material : Brown glazed porcelain

NOTE 1 — '-----' indicates ground surface.

NOTE 2 — '\*' indicates surfaces perpendicular to axis.

All dimensions in millimetres.

FIG. 17 INSULATOR FOR 24 AND 36 kV CABLE SEALING BOX BUSHING

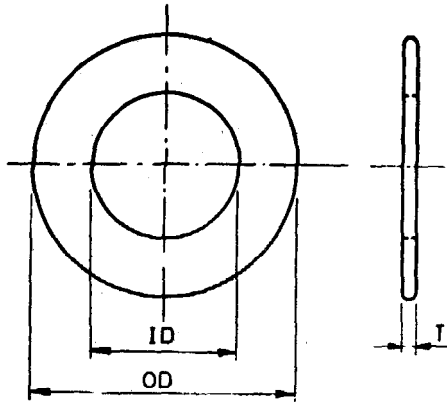
### 5.11 Washers

**5.11.1 Sealing Washer** — The dimensions of sealing washers for cable sealing box bushing shall be as shown in Fig. 18 and 19.

**5.11.2 Washer (Stem)** — The dimensions of washer (stem) for 12 kV cable sealing box bushing shall be as shown in Fig. 20. The dimensions of washer (stem) for 24 and 36 kV cable sealing box bushing shall be as shown in Fig. 21.

**5.11.3 Washer (Top-End)** — The dimensions of washer (top-end) for the cable sealing box bushing shall be as shown in Fig. 22.

**5.12 Nut** — The dimensions of nut for 12 kV cable sealing box bushing shall be as shown in Fig. 23. The dimensions of nut for 24 and 36 kV cable sealing box bushing shall be as shown in Fig. 24.



RATING kV/A		TYPE	ID	OD	T
12/250	{	M	14	35	3
		N	62	80	6
		P	26	45	3
12/630	{	M	22	50	3
		N	62	80	6
		P	41	56	2
12/1 000	{	M	38	70	3
		N	85	108	6
		P	46	70	3
24/630	{	M	42	70	3
		N	85	108	6
		P	42	70	3
36/630	{	M	42	70	3
		N	120	160	6
		P	42	70	3

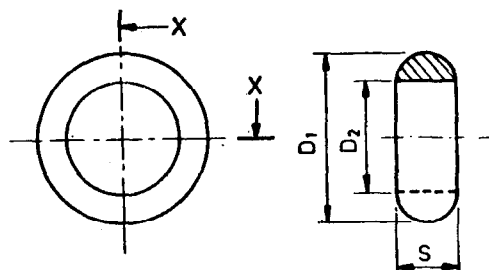
Tolerances on dimensions : ' Coarse ' according to IS : 2102-1969\*

Material : Synthetic resin bonded cork

All dimensions in millimetres.

FIG. 18 SEALING WASHER

\*Allowable deviations for dimensions without specified tolerances (*first revision*).



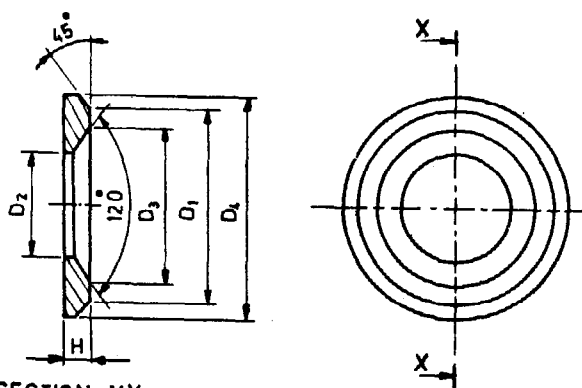
SECTION XX

RATING AMPERES	$D_1$	$D_2$	$S$
250	22	12	11
630	32	20	13
1 000	45	30	16

Tolerances on dimensions : ' Coarse ' according to IS : 2102-1969\*  
Material : Synthetic rubber

All dimensions in millimetres.

FIG. 19 SEALING WASHER FOR CABLE SEALING BOX BUSHING



SECTION XX

RATING kV/A	$D_1$	$D_2$	$D_3$	$D_4$	$H$
12/250	28	13	22	32	4
12/630	40	21	32	45	5
12/1 000	56	—	45	63	6

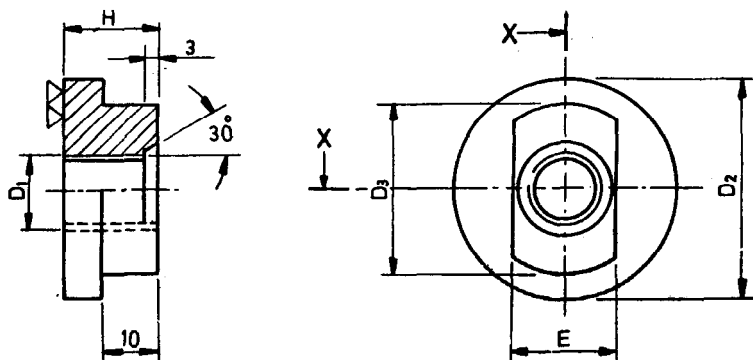
Tolerances on dimensions : ' Coarse ' according to IS : 2102-1969\*  
Material : Brass according to IS : 319-1962†

All dimensions in millimetres.

FIG. 20 WASHER ( STEM ) FOR 12 kV CABLE SEALING BOX BUSHING

\*Allowable deviations for dimensions without specified tolerances (first revision).  
†Specification for free cutting brass rods and sections (revised).





SECTION XX

RATING kV/A	$D_1$	$D_2$	$D_3^{+0}_{-2}$	$H$	$E^{+0}_{-2}$
12/250	M12	45	24	15	19
12/630	M20	56	39	18	27

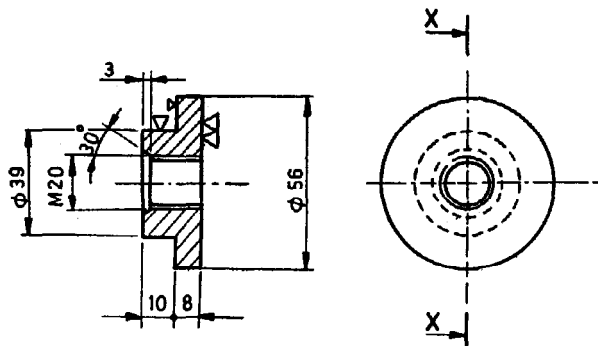
Tolerances on dimensions : ' Coarse ' according to IS : 2102-1969\*

Material : Brass according to IS : 319-1962†

NOTE — ▽▽ indicates medium machining.

All dimensions in millimetres.

FIG. 23 NUT FOR 12 kV CABLE SEALING BOX BUSHING



SECTION XX

Tolerances on dimensions : ' Coarse ' according to IS : 2102-1969\*

Material : Brass according to IS : 319-1962†

NOTE — ▽▽ indicates medium machining.

All dimensions in millimetres.

FIG. 24 NUT FOR 24/630, 36/630 kV/A CABLE SEALING BOX BUSHING

\*Allowable deviations for dimensions without specified tolerances (first revision).

†Specification for free cutting brass rods and sections (revised).



## 6. MARKING

**6.1** The cable sealing box shall be provided with the following information:

- a) Manufacturer's name or trade-mark,
- b) System highest voltage, and
- c) Rated current.

**6.1.1** The cable sealing box may also be marked with Standard Mark.

**6.1.2** The use of the Standard Mark is governed by the provisions of Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

## 7. TESTS

### 7.1 Classification of Tests

**7.1.1 Type Tests** — The cable sealing box shall be subjected to the following type tests unless otherwise specified by the purchaser:

- a) Physical examination ( 7.2 ),
- b) Checking of dimensions ( 7.3 ),
- c) Gland insulation test ( 7.4 ),
- d) Leakage test ( 7.5 ),
- e) Separate source voltage withstand test ( 7.6 ),
- f) Power frequency oil-immersed withstand voltage test for bushing ( 7.7 ), and
- g) Impulse test ( 7.8 ).

**7.1.2 Acceptance Tests** — The following shall constitute the acceptance tests:

- a) Physical examination ( 7.2 ),
- b) Checking of dimensions ( 7.3 ),
- c) Gland insulation test ( 7.4 ),
- d) Leakage test ( 7.5 ),
- e) Separate source voltage withstand test ( 7.6 ), and
- f) Power frequency oil-immersed withstand voltage test for bushing ( 7.7 ).

**7.1.2.1 Sampling scheme and criteria for conformity** — A recommended sampling scheme and criteria for conformity is given in Appendix B.

**7.1.3 Routine Tests** — The cable sealing box shall be subjected to the following routine tests:

- a) Physical examination (7.2),
- b) Gland insulation test (7.4),
- c) Leakage test (7.5), and
- d) Separate source voltage withstand test (7.6).

**7.2 Physical Examination** — The cable sealing box shall be examined for conformity to 4.2.1, and 4.3.1 to 4.3.8.

**7.3 Checking of Dimensions** — The cable sealing box shall be examined for conformity to 4.1.3, 4.3.9 to 4.3.11, 5.1.2, 5.1.3, and 5.2 to 5.12.

**7.4 Gland Insulation Test** — The gland insulation shall withstand a power frequency test of 2 kV applied for 1 minute between the assembled insulated gland and the body of the cable sealing box.

**7.5 Leakage Test** — The cable sealing box suitable for semi-fluid compound filling, shall be tested with transformer oil at room temperature at a pressure of 70 kN/m<sup>2</sup> for 30 minutes during which time no leakage shall occur nor shall there be any permanent deformation of cable sealing box surface when the pressure is released.

**7.6 Separate Source Voltage Withstand Test** — The complete cable sealing box filled with oil shall be capable of withstanding separate source voltage withstand test specified in IS : 2026 ( Part III )-1977\*

**7.7 Power Frequency Oil-Immersed Withstand Voltage Test for Bushing** — The bushing shall be immersed in insulating oil complying with IS : 335-1972† maintained at or about room temperature. The test voltage as specified in IS : 2099-1973‡ and approximately of sine wave form shall be applied for one minute between the stem and the earthed fixing flange of the bushing. The bushing shall withstand the test voltage without puncture or flashover.

**7.8 Impulse Voltage Withstand Test** — The complete cable sealing box shall be subjected to an impulse voltage withstand test for values

---

\*Specification for power transformers: Part III Insulation levels and dielectric test (first revision).

†Specification for new insulating oils for transformers and switchgear (second revision).

‡Specification for bushing for alternating voltages above 1 000 volts (first revision).

specified in IS : 2026 ( Part III )-1977\* and as per the method specified in IS : 2071 ( Part I )-1974† and IS : 2071 ( Part II )-1974‡.

**7.8.1** The test shall be made separately between each bushing and the earthed fixing flange. The bushing not under test shall be solidly earthed to the body of the cable sealing box.

**7.8.2** If the bushing alone is subjected to an impulse voltage withstand test the voltage applied shall be as specified in IS : 2071 ( Part I )-1974† and IS : 2071 ( Part II )-1974‡.

## 8. INFORMATION REQUIRED WITH ENQUIRY OR ORDER

**8.1** To enable the manufacturer to provide the correct equipment conforming to this standard, the following particulars shall be supplied by the purchaser:

- a) Number of poles,
- b) Number of glands,
- c) Type of cable and sectional area of the conductor,
- d) Diameter over metal sheathing,
- e) Diameter over armouring,
- f) Rated voltage, and
- g) Rated current.

## APPENDIX A

( Clause 5.9 )

### BUSHING ASSEMBLIES

#### A-1. 12-kV BUSHING ASSEMBLY

**A-1.1** A typical cable sealing box bushing assembly for 12/250 and 12/630 kV/A is shown in Fig. 25.

A typical cable sealing box bushing assembly for 12/1 000 kV/A is shown in Fig. 26.

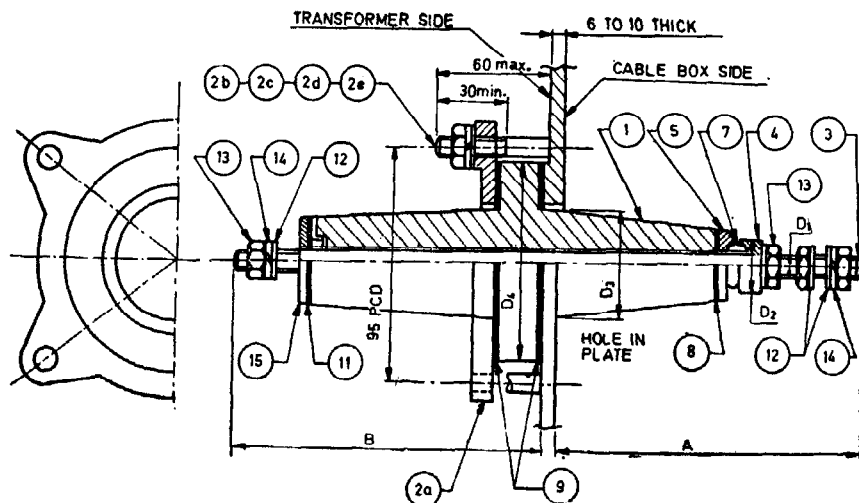
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\*Specification for power transformers: Part III Insulation levels and dielectric test (first revision).

†Methods of high voltage testing:

Part I General definitions and test requirements (first revision).

Part II Test procedure (first revision).



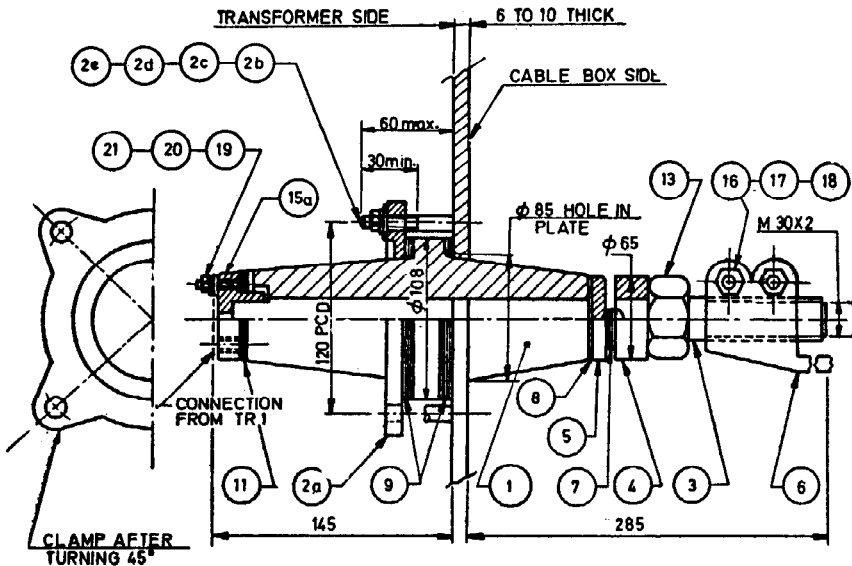
RATING kV/A	A	B	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>
12/250	175	170	M12	28	60	80
12/630	205	185	M20	40	60	80

Tolerances on dimensions : ' Coarse ' according to IS : 2102-1969\*

All dimensions in millimetres.

FIG. 25 CABLE SEALING BOX BUSHING ASSEMBLY 12/250, 12/630 kV/A

\*Allowable deviations for dimensions without specified tolerances (*first revision*).



Tolerances on dimensions : ' Coarse ' according to IS : 2102-1969\*

All dimensions in millimetres.

FIG. 26 CABLE SEALING BOX BUSHING ASSEMBLY 12/1 000 kV/A

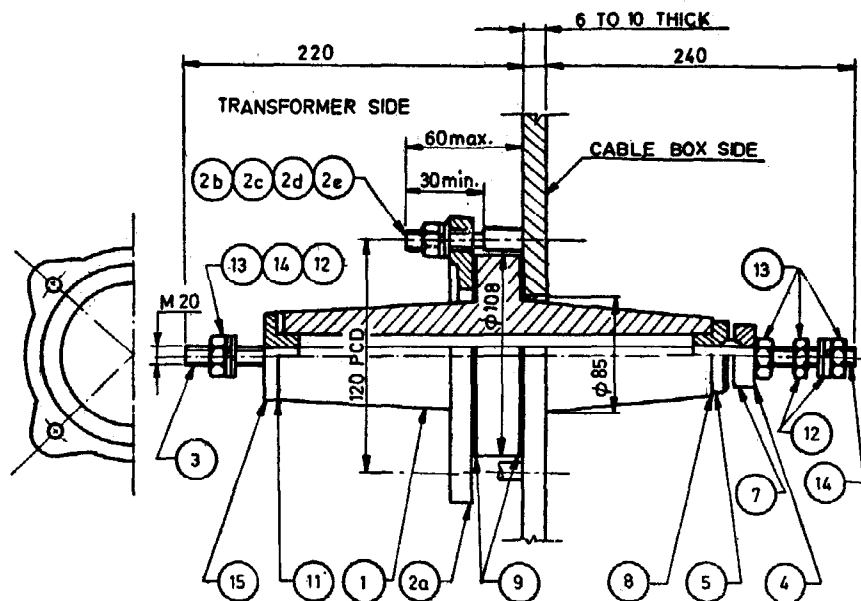
\*Allowable deviations for dimensions without specified tolerances (*first revision*).

## LIST OF PARTS CABLE SEALING BOX BUSHINGS

ITEM No.	No. OFF			DESCRIPTION	FIG. NO.	MATERIAL	SIZE
	250A	630A	1 000A				
1	1	1	1	Insulator	16		
2a	1	1	1	Clamp	13		
2b	4	4	4	Stud	—	Mild steel	M10
2c	4	4	4	Plain washer	—	Mild steel	M10
2d	4	4	4	Spring washer	—	Steel	M10
2e	4	4	4	Hexagonal nut	—	Mild steel	M10
3	1	1	1	Stem	2		
4	1	1	1	Washer ( top-end )	22		
5	1	1	1	Washer ( stem )	20		
6	—	—	1	Connecting lug	11		
7	1	1	1	Sealing washer	19		
8	1	1	1	Sealing washer Type M	18		
9	2	2	2	Sealing washer Type N	18		
11	1	1	1	Sealing washer Type P	18		
12	3	3	—	Plain washer	—	Brass	M12 (250A rating) M20 (630A rating)
13	4	4	1	Hexagonal nut	—	Brass	M12 (250A rating) M20 (630A rating) M30(1 000A rating)
14	2	2	—	Spring washer	—	Steel	M12 (250A rating) M20 (630A rating)
15	1	1	—	Nut	24		
15a	—	—	1	Connector	10		
16	—	—	2	Hexagonal screw	—	Mild steel	M12 × 40
17	—	—	2	Plain washer	—	Mild steel	M12
18	—	—	2	Spring washer	—	Steel	M12
19	—	—	2	Hexagonal screw	—	Mild steel	M10
20	—	—	2	Plain washer	—	Mild steel	M10
21	—	—	2	Spring washer	—	Steel	M10

## A-2. 24-kV BUSHING ASSEMBLY

A-2.1 A typical cable sealing bushing assembly for 24/630 kV/A is shown in Fig. 27.



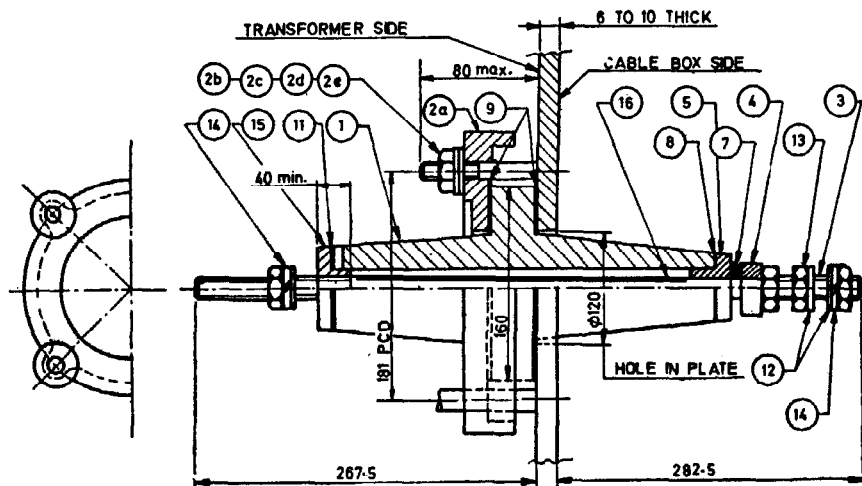
ITEM No.	No. OFF	DESCRIPTION	FIG. No.
1	1	Insulator	17
2a	1	Clamp	13
2b	4	Stud	—
2c	4	Plain washer	—
2d	4	Spring washer	—
2e	4	Hexagonal nut	—
3	1	Stem	2
4	1	Washer ( top-end )	22
5	1	Washer ( stem )	21
7	1	Sealing washer	19
8	1	Sealing washer Type M	18
9	2	Sealing washer Type N	18
11	1	Sealing washer Type P	18
12	3	Plain washer	—
13	4	Hexagonal nut	—
14	2	Spring washer	—
15	1	Nut	24

All dimensions in millimetres.

FIG. 27 CABLE SEALING BOX BUSHING ASSEMBLY 24/630 kV/A

**A-3. 36-kV BUSHING ASSEMBLY**

**A-3.1** A typical cable sealing box bushing assembly for 36/630 kV/A is shown in Fig. 28.



ITEM No.	No. OFF	DESCRIPTION	Fig. No.
1	1	Insulator	17
2a	1	Clamp	14
2b	4	Stud	—
2c	4	Plain washer	—
2d	4	Spring washer	—
2e	4	Hexagonal nut	—
3	1	Stem	2
4	1	Washer ( top-end )	22
5	1	Washer ( stem )	21
7	1	Sealing washer	19
8	1	Sealing washer Type M	18
9	2	Sealing washer Type N	18
11	1	Sealing washer Type P	18
12	3	Plain washer	—
13	4	Hexagonal nut	—
14	2	Spring washer	—
15	1	Nut	24

All dimensions in millimetres.

**FIG. 28 CABLE SEALING BOX BUSHING ASSEMBLY 36/630 kV/A**



## APPENDIX B

### ( Clause 7.1.2.1 )

#### SAMPLING SCHEME AND CRITERIA FOR CONFORMITY FOR CABLE END BOXES

##### B-1. SCALE OF SAMPLING

**B-1.1 Lot** — In any consignment, all the cable end boxes of the same rating and design manufactured under similar conditions shall be grouped together to constitute a lot.

**B-1.1.1** Samples shall be taken and tested for conformity from each lot.

**B-1.2** Samples shall be taken in accordance with col 1 and 2 of Table 2. These samples shall be chosen at random ( *see* IS : 4905-1968\* ).

**TABLE 2 SCALE OF SAMPLING**

LOT SIZE	FIRST SAMPLE	SECOND SAMPLE			
( $N$ )	( $n_1$ )	( $n_2$ )	$n_1 + n_2$	$c_1$	$c_2$
(1)	(2)	(3)	(4)	(5)	(6)
Up to 25	8	8	16	2	2
26 „ 50	13	13	26	2	2
51 „ 100	20	20	40	2	2
101 and above	32	32	64	3	4

##### B-2. NUMBER OF TEST AND CRITERIA FOR CONFORMITY

**B-2.1** Each cable end box selected shall be tested for acceptance tests. If it fails in any one of the acceptance tests, it shall be called a defective.

**B-2.2** Cable end boxes shall be selected according to col 1 and 2 of Table 2 and shall be tested for acceptance tests. If all the cable-end boxes chosen at the first stage pass the acceptance tests, the lot shall be considered as conforming to the specification. If the number of defectives are found to be equal to or greater than  $c_1$  then the lot shall be declared as not conforming to the specification. If the number of defectives are found to lie between zero and  $c_1$ , another sample of size  $n_2$  shall be taken and tested for acceptance tests. If the number of defectives in the combined sample is found to be greater than or equal to  $c_2$  the lot shall be declared as not conforming to the specification otherwise not.

\*Methods for random sampling.

*( Continues from page 2 )*

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